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Investigated were the attitudes of basic biological researchers toward information systems currently used, the usefulness of these services in meeting information needs, and the services expected from an advanced information system. A sample of 50 biological researchers from 14 academic institutions representing 19 areas of specialization was selected. Qualification for selection included current conduct or direction of basic biological research, recognition as a competent researcher by other scientists, and employment by a college or university on a full-time basis. Partially structured telephone interviews were used in collecting data. Results indicated that (1) biological scientists engaged in basic research consult periodicals containing abstracts, indexes, and reviews much more than they consult individuals, libraries, or services that search and retrieve information on the individual's request, (2) when biological scientists retrieve information themselves, they tend to use personal or organizational libraries, employing traditional manual methods, (3) most scientists with experience in the use of formal search and retrieval methods worked within a five-mile radius of the information system, and (4) scientists were not aware of the existence or functions of established information systems. (DS)

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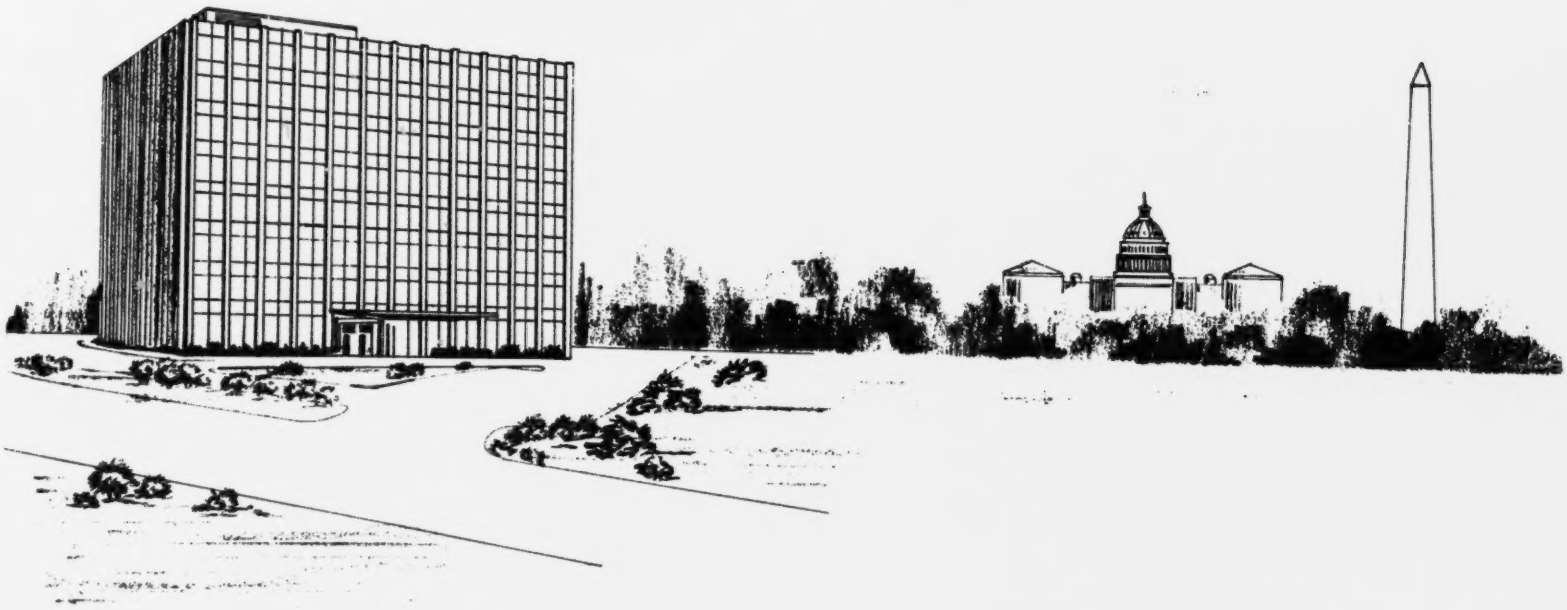

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FOREWORD

The investigation described in this report was supported by the National Science Foundation, Contract Number C-492.

The authors wish to thank Mrs. Grace Gurtowski, Dr. B. L. Clarke, and Dr. H. P. Van Cott for their contributions. In addition, the cooperation of the biological scientists who participated in this study is gratefully acknowledged.

ABSTRACT

The research described in this study was performed to provide information on the attitudes of basic biological researchers toward the information systems currently used, the usefulness of these services in meeting information needs, and the services expected from an advanced information system. Partially structured telephone interviews, rather than observations of actual behavior, were used in determining these attitudes.

A sample of 50 biological researchers from 14 academic institutions, representing 19 areas of specialization, was selected. Qualifications for selection of participants included current conduct or direction of basic biological research, recognition as a competent researcher by other biologists, and employment by a college or university on a full-time basis. Selection was also geared to obtain a sample of scientists from institutions of various sizes and distances from the Washington, D. C. area.

Biological scientists engaged in basic research report that they consult "Current Awareness Services" (i. e., periodicals containing abstracts, indexes, and reviews) much more often than they do "Self Search and Retrieval Services" (i. e., individual consultation with personal, university, or government libraries) or "System Search and Retrieval Services" (i. e., services that search and retrieve information on the individual's request). Awareness of recent research findings is gained largely by skimming titles and, on occasion, abstracts. According to personal reports, when biological scientists do search and retrieve information themselves, they tend to use personal or organizational libraries, employing traditional manual methods. Most of those with experience in the use of formal search and retrieval systems worked within a five-mile radius of the system, suggesting that location in

proximity to an information system is a critical factor in determining its use. In general, reporting biological scientists were not aware of the existence or functions of established information systems.

INTRODUCTION

Within the last decade, there has been a growing interest in providing scientists with more advanced information systems. The desired benefits are: to improve the quality of research, replace time currently spent for information search with time in the laboratory, and to permit scientists to gain better access to an ever increasing volume of published information. In response to this need for improved information services, a number of advanced scientific information systems have been established. Some of them are pilot or feasibility systems, and others are operational. They are supported by governmental agencies, academic institutions, and scientific societies. In the Washington, D. C. area alone, twelve information systems are immediately accessible to biological scientists working in Maryland, Virginia, Delaware, and the District of Columbia.

What do biological scientists performing basic research think of these systems? Are they taking full advantage of the service offered? Do the systems adequately meet their perceived informational needs? If not, what other services do the scientists believe they would use?

This study is one of a series to establish recommendations for scientific information services to biological scientists. This study was initiated to provide information about basic and applied researchers' attitudes towards the services they currently use and those they would reasonably expect from advanced information systems.

Partially structured telephone interviews was the method adopted to obtain these qualitative descriptions of biological researchers' attitudes. A set of questions was constructed to help the interviewer structure the interview and to provide the scientist with an opportunity to discuss various aspects of his feelings about information systems. The set of questions was intended to determine (a) what information services are presently consulted, (b) how well the services meet informational needs, and (c) what additional services are needed.

METHOD

Subjects. Fifty biological researchers participated in the study. To be invited, the scientists had to be (a) actively engaged in conducting or directing basic biological research, (b) recognized as a competent researcher by other biologists, and (c) employed on a full-time basis by an academic institution, i. e., college or university. In addition to these restrictions, an attempt was made to select a representative sample with respect to (a) size of the institution employing biological researchers (b) distance from Washington, D. C., and (c) area of specialization.

Biologists from 14 colleges and universities in Washington, D. C., Virginia, Maryland, and Delaware were selected representing 19 specific disciplines. The names of these scientists were selected from a list of people receiving NSF grants or awards in 1966-1967 and from the current membership lists of the six societies of the Federation of American Societies for Experimental Biology.

Procedure. An introductory letter was mailed to each scientist who was selected. This letter described the general purpose of the survey and the topics that would be discussed during the interview. Approximately one week later the scientists were asked to indicate what information systems they used and how frequently they used them. Many replied at length, while others provided very simple answers to the questions. An attempt was made to stimulate free discussion but, where this was not successful, questions were asked and answers recorded in writing.

RESULTS

Scientists have three ways of keeping up with new information in their field. Most frequently they turn to those periodicals and some journals which contain abstracts, indexes, and reviews. This service is referred to as "Current Awareness Service." Less often they consult personal, university or governmental libraries, a "Self Search and Retrieval Service." Least often they use services which search and retrieve upon their request, the "System Search and Retrieval Service."

The relative frequency of the use of these three types of services is shown in Figure 1. It can be seen that the scientists consulted a "Current Awareness Service" more than twice as often as the next most frequently consulted type of service -- the "Self Search and Retrieval Service." The "Self Search and Retrieval Service" was consulted more than three times as often as the "System Search and Retrieval Service."

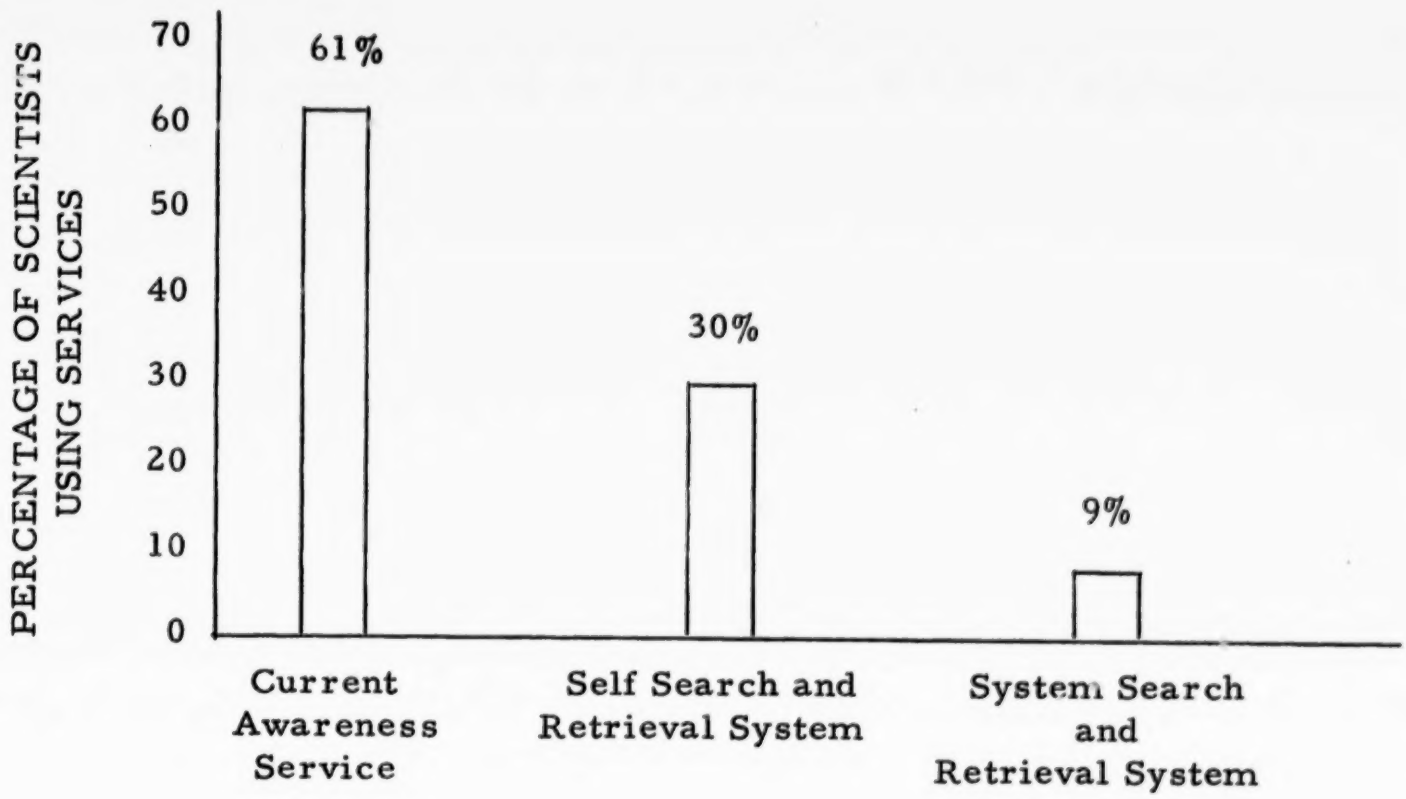
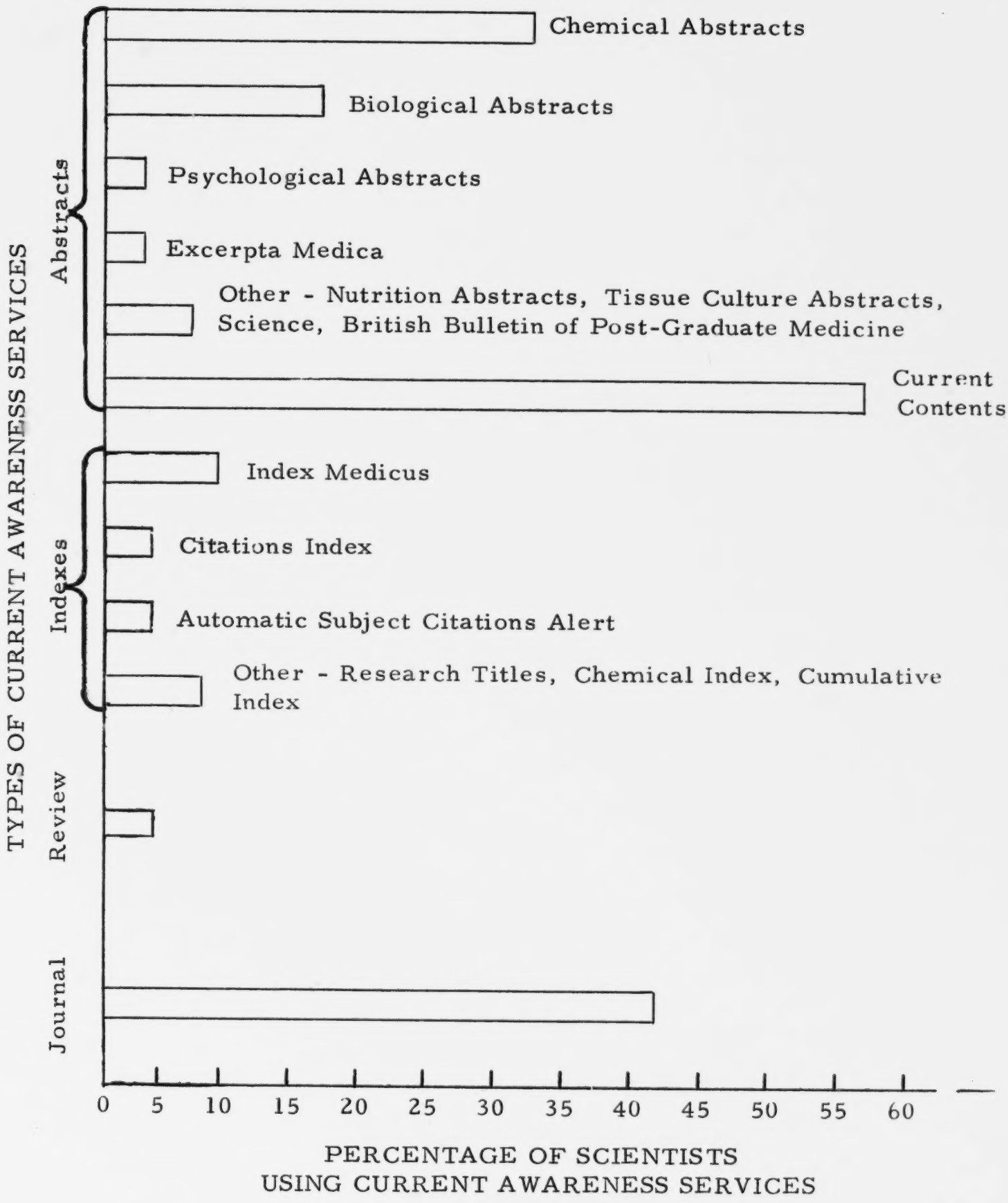


Figure 1. Relative frequency of use for three different types of information services.

With respect to the "Current Awareness Service", each scientist reviews an average of two periodicals on a regular basis. The most popular "Current Awareness Service" is supplied by Current Contents. Over fifty percent of the scientists interviewed used Current Contents. The next most popular "Current Awareness Service" is supplied by Chemical Abstracts, with Biological Abstracts following in popularity. Among the other periodicals providing a "Current Awareness Service" are Index Medicus, Citations Index, and ASCA. In addition, forty percent of the scientists specifically mentioned their regular review of several journals as a means of keeping themselves informed of the nature of recent research. The proportion of scientists using each of the "Current Awareness Service" periodicals is shown in Figure 2.

With respect to the "Self Search and Retrieval Service", over fifty percent of the scientists stated that they relied exclusively on their personal and organizational libraries. An additional thirty percent said that they visited other libraries, such as the National Library of Medicine. However, these libraries were used primarily when the desired information was not available in their personal or organizational libraries. Only fifteen percent of the scientists specifically mentioned the use of inter-library loan services, although others may have received the benefits of these services when they asked their librarian for information. These relationships are shown in Figure 3.

With respect to "System Search and Retrieval Service", only twenty percent of the scientists mentioned that they had ever used this type of service. The system most frequently used is MEDLARS (Medical Literature Analysis Retrieval System). Other systems mentioned by the scientists were the FDA Retrieval System, and the Science Information Exchange.


TYPES OF CURRENT AWARENESS SERVICES
Abstracts
Chemical Abstracts
Biological Abstracts
Psychological Abstracts
Excerpta Medica
Other - Nutrition Abstracts, Tissue Culture Abstracts, Science, British Bulletin of Post-Graduate Medicine
Current Contents
Indexes
Index Medicus
Citations Index
Automatic Subject Citations Alert
Other - Research Titles, Chemical Index, Cumulative Index
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PERCENTAGE OF SCIENTISTS USING CURRENT AWARENESS SERVICES

Figure 2. Frequency of using different "Current Awareness Services"

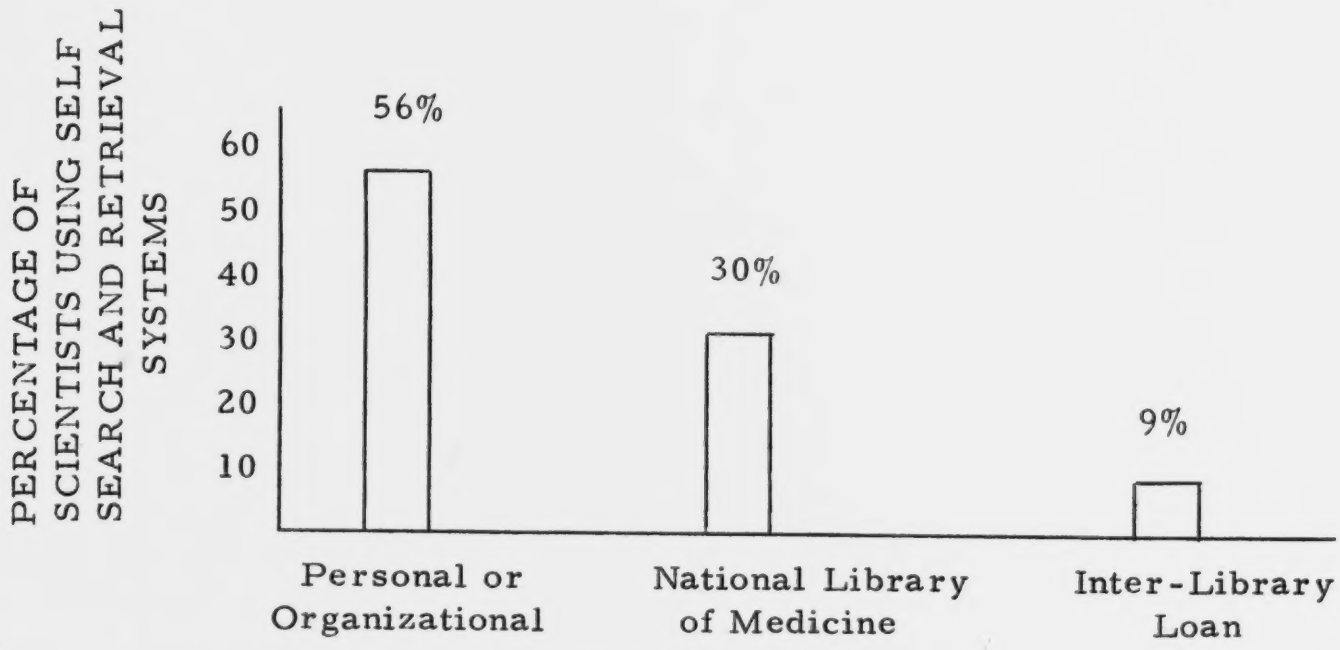

Figure 3. Frequency of Usage of "Self Search and Retrieval Services"

Of the scientists using MEDLARS, over half are affiliated with universities in the Washington area, within five miles of the MEDLARS System. Some of the Washington scientists using MEDLARS also used the FDA Retrieval System or the Science Information Exchange which are also located in Washington.

In evaluating the various types of information services, the scientists were generally satisfied with their services. They did complain about slowness and expense. Several users summarized comments by saying that the Current Contents was an excellent service... of great value... that it covered the complete medical area... that it was a good idea but should be extended to other fields within biology... and that it was helpful to their research. A few users criticized the service for supplying reprints too slowly, or not at all if the reprint supply was exhausted. Some users stated that the Index Medicus was a good service, but too far behind the times. No one provided either positive or negative criticisms of their "Self Search and Retrieval Service." The concensus of MEDLARS users was that it was a reasonably good service, and requests were answered very thoroughly.

However, many also commented that the service was too slow, and the search was not selective enough. One user commented that the product was inadequately documented in terms of current references indices.

Most of the comments regarding additional information services concerned "Current Awareness Services." Most popular were suggestions to index the names of scientists according to their most recent area of research, and to list the means of contacting these scientists. Another popular suggestion was to devise some system for supplying a continuous flow of information on particular topics of interest. One further prevailing attitude was that a publication along the lines of Current Contents would be helpful in a variety of specialized biological fields. The compilation and frequent updating of lists giving references for biologically active compounds was also a popular recommendation.

A number of less common suggestions included: a periodic review of materials introduced at symposia; a current list of monographs and books going back as far as the old classics on selected topics; an index of educational research films in biology; and bibliographic cards for all journals, indexed with summaries. One frequently mentioned suggestion was for translation services in different capacities. For example, one scientist merely wanted foreign abstracts published because he could read the originals well enough himself; another wanted translations of the more rarely used languages, e.g., Chinese, Eastern European, etc., rather than the more frequently translated languages such as Russian or German.

A few scientists made suggestions for reducing the quantity of information rather than for handling it. One scientist said that fewer publications with better editing was the answer to the information explosion. Another said that good review articles with good writers and bibliographies were needed rather than a retrieval system. A major emphasis was put upon the filtering of information before it was placed in a storage system.

DISCUSSION

The major finding of this study is that scientists who are performing basic research in the biological sciences spend more of their time with a "Current Awareness Service" than with either a "Self" or "System Search and Retrieval Service." Apparently, the scientists are much more concerned with becoming aware of the most recent research findings. A large proportion of a scientist's information-searching activities are devoted toward scanning titles, and occasionally, abstracts for reports of research consonant with particular interests. Fishenden (1959) using a diary survey approach with atomic energy researchers also found heavy usage of current and abstract literature sources. Bottle (1965) adds that when seeking such current awareness information many scientists resort to their own informal channels of communication rather than to formal information services.

When the scientists do feel a need to perform a search and retrieval function, they tend to use their personal and organizational libraries with traditional methods of manual searching. Herner (1954) also found that basic researchers "prefer to do their own bibliographic searches" whereas the "applied scientist generally prefers to have his bibliographic searches done for him." Few of the basic scientists have had any experience with formal system search and retrieval systems and it is interesting to note that of those who have, most worked within a five mile radius of the system. This suggests either proximity or familiarity with the system is essential.

In discussing with scientists the use of formal search and retrieval systems, the interviewer was given the impression that many were not aware of these systems' existence. Even when they were, they appeared to be confused as to functions performed by the systems, and procedures that should be followed to use them, as indicated by the

nature of their suggestions. For example, one of the needs expressed was for a system that would supply the names of other researchers working in a particular area. This function is actually being performed by the Science Information Exchange, but only one of the scientists said he used it. Also, there were suggestions for a continuous flow of information on specific subjects. In operational information systems, this is termed "Selective Dissemination of Information" (SDI) and is also provided by several existing information systems such as National Agriculture Library, Clearinghouse for Federal Scientific and Technical Information, and Defense Documentation Center.

A comparison should be drawn between the attitudes of the applied and those of basic biological researchers. Perhaps their informational needs are quite different. The applied researcher may not be as interested in a "Current Awareness Service" as he is in a formal search and retrieval system, because his research is dictated by the nature of a problem rather than his own interests. The basic researcher, on the other hand, has more flexibility in choosing and is likely to be doing research in an area in which he is familiar with previous findings. These are, of course, merely speculations concerning possible differences between the informational needs of basic and applied researchers, but the attitudinal survey of Herner (1954) tends to support this difference. Carter (1966) also points out that there are at least three kinds of information services which are necessary, one for the scientist and scholar, a second for the engineer, and the third for the managers of technical efforts.

How much reliance can one place on the results of this study? Does what a scientist say about what he wants or needs really represent a genuine requirement or a general frustration with what exists? If the scientist were given what he says he wants, would he indeed use it? One cannot be certain, for much research on human behavior fails

to reveal a correlation between opinion and actual behavior in the situation about which opinion is stated. Thus, while user studies such as this one may provide hypotheses about existing information problems and about possible services or system solutions to these problems, the genuine test of the hypotheses is to study actual behavior.

CONCLUSIONS

The following hypotheses were derived from the results of this study: (1) scientists are more concerned with becoming aware of recent research than they are of searching for and retrieving less recent information; (2) scientists tend to use traditional methods of manually searching for desired information; (3) the use of formal search and retrieval systems may depend on system proximity; and (4) in general, biological scientists are not aware of the existence or the functions of established information systems.

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